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ABSTRACT

This report describes the expansion of the Select Program in Science and Engineering (SPISE) to provide participants with a second year experience designed to increase the impact of the program on college and career selection by enabling students to select an area of special interest for study. The target population for SPISE is economically disadvantaged young people. Approximately 90% of the students are Black and Hispanic, with other minorities representing an additional 5% of the enrollment. This document includes: (1) a description of the program; (2) a breakdown of the choices made by SPISE participants; (3) evaluation data on the progress made by SPISE participants in mathematics, and on their changes in attitudes toward both science and mathematics; and (4) budgetary information. (TW)

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SELECT PROGRAM IN SCIENCE AND ENGINEERING

AT

THE CITY COLLEGE
OF
THE CITY UNIVERSITY OF NEW YORK

NINTH ANNUAL REPORT

1986 - 1987

Program Directors
Professor Alfred S. Posamentier
Professor Demos Eitzer

JULY 1987

SE 048 576

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NINTH ANNUAL REPORT

1986 - 1987

SELECT PROGRAM IN SCIENCE AND ENGINEERING

S P I S E

and

SPISE-EXTENDED

at

The City College
of
The City University of New York

Exceptional Achievement Award, College and High School Partnerships
Council for Advancement and Support of Education

Exemplary Program Citation
National Institute of Education
"A classic high school outreach program directed at involving more minorities in science and engineering is perhaps one of the most successful of its kind"

Exemplary Program Model for Replication
New York City Board of Education

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NINTH ANNUAL REPORT

1986-1987

SELECT PROGRAM IN SCIENCE AND ENGINEERING

SPISE and SPISE-EXTENDED

With the financial support of corporations and foundations, the New York City Board of Education, and City College, the Select Program in Science and Engineering (SPISE) was conducted for the ninth year, serving New York City students from 18 high schools in the boroughs of Manhattan, Bronx, Queens and Brooklyn. This past year, the SPISE program was expanded to provide participants with a second year experience designed to increase the impact of the program on college and career selection by enabling students to select an area of special interest for study. The SPISE experience now offers an all-day Saturday program for ten weeks during the first year, and a five week Saturday program during the second year (SPISE Extended).

1986-1987 STUDENT PROFILE

The target population for SPISE is economically disadvantaged young people, a group which usually exhibits educational disadvantage as well. This design results in a high level of minority participation. Approximately 90% of the students are Black and Hispanic, with other minorities representing an additional 5% of the enrollment.

In an effort to increase participation of limited English proficiency students, two bilingual teachers were added to the program staff in 1986-87 and a special

recruitment drive was undertaken that resulted in the enrollment of an additional 32 Spanish-dominant students.

Most students participate during the sophomore year, but a small percentage of upper class students also are enrolled. The grade level of the past year's participants is shown on the chart following.

Grade Level of SPISE Participants - 1986-1987

	SPISE			SPISE-Extended		
Grade	Male	Female	Total	Male	Female	Total
10	268	165	433			
11	30	12	42	173	106	279
12	7	3	10	33	15	48
	305	180	485	206	121	327

Young women are well represented, comprising 37% of both the SPISE and SPISE Extended groups, a total of 301 girls.

ATTENDANCE AND SUCCESSFUL COMPLETION RATES

The high level of interest and commitment of SPISE students is evident in attendance which averaged 87% for the year, and in successful course completion. Eighty four percent (84%) of the 485 SPISE students, and 88% of the SPISE Extended group of 327, achieved success in their courses. Examined by sex, more girls than boys attained success in SPISE (89% versus 85%), but more males succeeded in SPISE Extended (92.5% versus 82.7%).

Approximately two-thirds of the students who participated in SPISE indicate they plan to continue further training in these disciplines. While it was planned to serve only 250 students in the two pilot sessions of SPISE Extended, the response by the previous years participants was so great, 327, that it exceeded the goal for the

second year of operation of the new program. These represent a significant endorsement of the program, and also provide a strong indicator that participation in SPISE will achieve its long range as well as short term goals.

PURPOSE

The major goal of SPISE is to motivate and prepare more minority students for college and careers in engineering and science. Essential to the achievement of that goal is the motivation of SPISE participants to select and successfully complete advanced mathematics courses in high school. This preparation enables them to enroll immediately, or within one semester, in college level calculus, and to do well in freshman chemistry and physics courses where success is highly dependent upon mathematics and problem solving skills. This kind of academic start to a college career allows the selection of a major in science or engineering to be realistic and reasonable.

PROGRAM AND STAFF

SPISE

Conducted twice a year, serving approximately 250 students at each program, 10 Saturday sessions from 9:00 a.m. to 2:30 p.m.

Morning session

Mathematics Class - concepts and skills needed in subsequent laboratory sessions (enrichment topics)

Laboratory Experience in Science or Engineering - develop laboratory and applied mathematics skills, and introduce new and exciting concepts and processes which highlight the fields of science and engineering.

LUNCH

Afternoon Sessions

Personal and Career Counselling and Guidance - assess aptitudes and interests; goal and priority setting; academic preparation required for college and careers; college selection, application and financial aid

Lectures - Professional role models from industry, government, and academe

Col. Charles Bolden, NASA Astronaut

Dr. G. Campbell, AT&T Bell Laboratories

Norman Lesser, Chief Mechanical Engineer, Port Authority of NY/NJ

SPISE-Extended

Conducted twice a year, serving up to 150 students who have completed the SPISE program; 5 Saturday sessions from 9 a.m. to 4 p.m.

Co-Directors of the SPISE programs are Dr. Alfred Posamentier, Associate Dean in the School of Education, and Demos Eitzer, Professor of Electrical Engineering and former Dean of The School of Engineering at City College.

SPISE and-SPISE Extended are conducted by a team of college professors and high school mathematics and science teachers who jointly develop curriculum, content, materials, and methods, and act as teachers and mentors for SPISE participants. More than a dozen City College faculty from the Division of Science, the School of Engineering, and the School of Education provide outstanding resources.

A mathematics and a science teacher from each of the 18 participating high schools complete a team rich in resources for program development and outstanding teaching. Teachers encourage and assist participants all year long at their home high

school, providing an ongoing support system to encourage academic achievement and high aspirations.

A group of college and high school teachers with long experience in SPISE was selected, and spent the Fall 1986 semester, in planning the new SPISE Extended program. Two pilot sessions were conducted during the Spring 1987 semester. The 1987-1988 budget contains funds for workshops for the teachers to make curriculum and content modifications based on evaluations of the initial sessions.

PROGRAM OUTCOMES

Each year, SPISE carries out a variety of evaluation processes which provide substantial evidence that the program is successful in achieving the short range objectives and long range goals. Tests and questionnaires completed by students at the finish of each program consistently show the positive impact of the program. Surveys conducted when participants graduate from high school validate its long term effects.

- A pre and post mathematics test indicates a significant increase in achievement - both in improved performance in skills previously studied and in the acquisition of new concepts and skills.

- Despite the fact that students who enroll in SPISE are very likely to hold more positive attitudes toward science and mathematics than other students, pre and post attitude scales show that these affirmative feelings are strengthened, and negative attitudes reduced, by participation.

- Since continued student participation in mathematics and science is linked strongly to experiences which challenge and stimulate but do not overwhelm, the consistently high ratings given by participants to the various program components indicate SPISE is a positive encounter which encourages and supports higher aspirations.

■ Surveys at graduation show that between 85-90 percent of the respondents have completed three, four, or more advanced mathematics courses in high school, a major goal of SPISE.

■ Virtually all survey participants report enrollment in college.

■ Approximately three-quarters select a college major in mathematics, science, engineering or a computer related discipline. More than two-fifths major in engineering. Recently, the proportion selecting science or mathematics has increased, while computer related choices have declined slightly.

■ With increased attention to additional contacts during the junior and senior years, the survey response rate has increased. With the initiation of SPISE Extended, which will provide many more SPISE students with a fully developed second year experience, a further increase in responses is anticipated.

■ SPISE adds a significant number of Black and Hispanic students to the pool of college students preparing for careers in scientific and technological fields.

The following sections discuss more fully each of the outcomes, describing the evaluation measures and results.

CHOICES OF SPISE PARTICIPANTS - HIGH SCHOOL COURSES, COLLEGE MAJORS, COLLEGE

Survey results for SPISE students who graduated from high school in 1986 are similar to those of earlier groups. A larger number of this group responded than in previous years.

An overwhelming majority of 91% completed three or more years of mathematics in high school. A tally of responses from all SPISE participants from 1978 through 1986 shows the percentage completing 3 or more years is 88%.

Survey Results

SPISE Participants Graduating from High School in 1986

Last Math Course Completed in High School	
Calculus	62
Senior Math/Advanced Algebra	46
Computer Math	5
Probability/Statistics	5
Algebra II/Trigonometry	50
Geometry	6
Elementary Algebra	3
Business Math	1
Completed 4 Years Math	63.5%
Completed 3 years Math	28.1%
Less than 3 Years Math	5.6%
# Years Not Clear	2.8%

College Major Selected	
Engineering	72
Science/Mathematics	29
Computer Related	28
Medicine	15
Psychology	2
Business	8
Liberal Arts	17
Law	2
Mathematics/Science Related	74.6%

178 Respondents

40% Response Rate

College Selected for Enrollment	
City College of New York	32
New York University	3
Queens College, CUNY	3
Stony Brook, SUNY	3
New York City Technical	3
Binghampton, SUNY	3
Hunter College, CUNY	3
Brooklyn College, CUNY	3
Lehman College, CUNY	3
Rensselaer Polytechnic	3
Baruch College, Cuny	2
Columbia University	2
SUNY at Albany	2
Queensboro Community College	2
Pace University	2
Buffalo, SUNY	2
Cooper Union	2
University of Rochester	2
New York Institute of Tech.	1
Polytechnic of New York	1
Syracuse University	1
Cornell University	1
Howard University	1
St. John's University	1
Fordham University	1
Massachusetts Inst. Tech.	1
LaGuardia Community College	1
Manhattan College	1
Stevens Inst. Tech.	1
Others	19

Seventy-four percent (74%) selected a college and career goal in science, engineering, mathematics or computers, indicated by the choice of college major. This is virtually the same proportion found in the total of graduates from all years.

Thirty percent (30%) elected to enroll at City College. A large proportion enroll at other colleges and universities in New York State. A smaller percentage leave the State to attend college.

The responses to the survey questionnaire of SPISE participants who graduated in 1986 are displayed on the preceding page. Noteworthy results are that 91% completed three or more years of mathematics in high school; 42% selected engineering as a college major, with 27% choosing science or mathematics, and 16% computer related major. Three-fourths thus indicated that they are preparing for careers in scientific and technological fields.

INCREASED ACHIEVEMENT IN MATHEMATICS - PRE AND POST TEST COMPARISONS

The mathematics test is comprised of two sections. Two-thirds of the thirty item test is designed to measure students' abilities and knowledge in basic arithmetic computations, basic algebra and geometry. The other third of the test, consisting of ten items, is designed to assess students' achievement and knowledge of the kinds of mathematical skills and contents which will be taught during the SPISE program.

A comparison of the average scores of six groups of SPISE students on Part I of the pre and post tests shows growth in achievement. The average score prior to participation ranged from 12.74 to 15.36 for the six groups. Upon completion of the 10 week experience, the average scores ranged from 14.62 to 16.87. Averaged across all groups, students increased the number of correct answers by two. On the 20 item test, this is an increase of 10% in student achievement measured by correct answers.

A comparison of pre and post test scores for Part 2, which measures the mathematics content which is the focus of the program, is even more dramatic. Average correct scores for the pre test ranged from 2.35 to 3.02. At the completion of the program, the average scores for the six groups ranged from 4.44 to 6.05. Students doubled the number of questions correctly answered, with an average gain of 2 1/2 additional correct answers. On a ten item test, this represents a 25% increase in correct responses.

Standard deviations were calculated to determine the significance of the changes in mean scores. All differences were found to be significant. With a t value significant at the .001 level of confidence, t values ranged from 8.78 to 14.58 for Part 1. The t values for Part 2 are especially striking, ranging from 13.65 to 25.47. The t value for three of the six groups exceeded 20.

Results for the past year's groups are shown in Table 2 in the Appendix.

INCREASE IN POSITIVE ATTITUDES TOWARD SCIENCE AND MATHEMATICS

Future participation in study and careers in scientific and technological careers is improbable without strong affirmative feelings. To gauge the effect of participation in SPISE upon student feelings, an attitude scale of 20 Likert-type items is administered at the first and final sessions of each SPISE program. (See Table 2 in the Appendix). Comparisons of pre and post test results are made by measuring differences in the means for all items. Means are developed by assigning numeric values of 1-5 for given response categories ranging from "strongly disagree" to "strongly agree". Any increase in the means figure indicates an increase in positive attitudes, or a decrease in negative attitudes, depending upon how the question is posed.

Examining the results of the pre and post tests of eight groups of SPISE students, the following chart shows significant improvement in attitude following participation. Except for the 1986-87 groups, attitudes toward science shows a greater improvement than is seen for mathematics. In the case of the Fall 1986 and Spring 1987 groups, the improvement in attitude toward mathematics was similar to other years, but a smaller increase was registered in positive attitudes toward science.

Increase in Positive Attitudes Toward Science and Mathematics

Attitude	F 1982	S 1983	F 1983	S 1984	F 1985	S 1986	F 1986	S 1987
Toward Science	+3.86	+2.80	+4.31	+4.44	+4.13	+3.65	+2.97	+2.61
Attitude Toward Math	+1.24	+2.56	+2.72	+2.93	+2.73	+3.12	+2.97	+3.10

The increase in positive attitudes about science correlates strongly with the responses of students to open ended questions on the anonymous evaluation form which each one completes. Students express an especially strong feeling of satisfaction with their experiences in science and engineering laboratories provided by SPISE.

Table 3 in the Appendix is a summary of the attitude scale pre and post test results for the Fall 1986 and Spring 1987 groups.*

QUALITY OF SPISE EXPERIENCE - RATINGS BY STUDENTS

An overarching objective of SPISE is to provide an experience which is challenging and engrossing so that students are so stimulated and find such personal satisfaction that the attraction of continued exploration of mathematics and science will be irresistible. While this is a great challenge, it is possible to assess to some

Student Evaluations - Ratings of Program Components

	Fall 1982		Spring 1983		Fall 1985		Spring 1986		Fall 1986		Spring 1987	
	Poor	G or E	Poor	G or E	Poor	G or E	Poor	G or E	Poor	G or E	Poor	G or E
Overall Teaching Quality	0%	92%	0%	90%	0%	90%	1%	90%	1%	90%	0%	92%
Math Program and Instruction	0	96	1	89	1	88	1	92	2	94	2	89
Engineering Lab Experiences	1	90	2	90	2	88	1	89	3	92	1	89
Science Lab Experiences	0	95	1	92	1	90	0	89	2	86	1	93
"After Lunch" Lectures	7	66	15	53	6	69	3	64	5	65	3	60
Counseling	11	55	24	45	8	70	5	73	6	70	4	80
Overall Organization of Program	1	94	1	86	1	94	1	97	0	97	1	94
Special Features					4	80	4	71	5	81	4	73

* G=Good, E=Excellent

Each year, students are asked to rate the level of difficulty of content material, judging whether it is too easy, too hard, or about right in the challenge it provides. Following are the responses of six SPISE groups.

Student Rating of Level of Difficulty of Content Material

Level of Difficulty	Fall 1982	Spring 1983	Fall 1984	Spring 1985	Fall 1986	Spring 1987
Too Easy	16%	20%	13%	9%	9%	10%
Just Right	80	76	82	85	89%	87%
Too Hard	2	4	5	6	2%	3%

While some of the variations in percentages from year to year can be traced to differences in the level of preparation of different student groups, the reduction in the number finding the contents too easy between 1983 and 1986 is due, in part, to continued review and refinement of the curriculum and content.

degree how students are affected by participation. A Student Evaluation Questionnaire provides the means for students to express their feelings about the quality of their experience by rating each program component, rating the level of difficulty of content, and responding to open ended questions.

Consistently a huge majority of participants rate highly the academic and instructional portions of SPISE. The following charts show that 88% or more rate teaching quality, and the mathematics, science and engineering experiences as good or excellent. Looking at it from another perspective, 2% or less rate them as poor. Changes in the counselling sessions based on student evaluation of past activities has increased the percentage of positive ratings to close to three-fourths. This percentage is still considerably below that of the instructional components. The "After Lunch" lectures, which include outside speakers, continue to receive the students' lowest ratings. Ratings of these sessions can vary dramatically based on the charisma of the guest speaker and the attraction of the topic. For the past two years a smaller number of more carefully selected individuals have been invited to participate to try to increase the value of this segment.

The following chart shows the lowest and highest ratings for program components, by percentage of students.

EVALUATION OF SPISE-EXTENDED

With the initiation of a new program, with a new curriculum and content, evaluation was particularly important for the SPISE-Extended program. While SPISE provides a common experience for all students, with a significant mathematics base and varied science and engineering experiences, SPISE-Extended allows the individual to select one of three areas of interest for study: Chemistry, Physics, or Computer Science. With three different tracks, some of the evaluation results reflect strengths and/or weaknesses pertinent to a specific component.

Looking at the responses on a broad basis, some very positive findings emerge.

- Eighty percent of participants rated the experience positively--characterizing it as good, great, or one of the best. More than 70% of the chemistry group, and 40% of the physics group, rated it great or one of the best.
- All except one student responded that they would like to study further in this type of program. This is a good indicator that the experience enhanced and supported interest in science.
- A third very positive outcome was the effect of participation on the individual's interest in pursuing science or engineering as a career. Eighty-five percent reported a positive change in the level of interest in such careers. One-quarter said the effect was to make them a 'lot more interested', and an additional third answered, 'some more interest'.

Significant differences in the level of preparation of students in the computer science component presented problems, and these are reflected in their evaluation. Changes in curriculum and content are being planned based on this year's experience.

The Chemistry segment consistently received the highest ratings, followed by the Physics experience. Differences in the academic background also surfaced in Physics, so some students requested that the course be made more advanced.

Asked to make suggestions for program improvement, a minority of students recommended increasing the length of the program. Most suggestions for change were made by students in the computer science group.

A copy of the responses to the evaluation questionnaire for SPISE-Extended may be found in the Appendix.

EXPENDITURES

1986-1987 Academic Year

	SPISE	SPISE-Extended
Faculty/Professional Salaries	$28,846.00	$21,787.00
Supervision/Administration	12,000.00	6,000.00
Honoraria	1,025.00	
Clerical	6,375.00	
FICA	2,074.99	1,318.46
Calculators	6,310.00	
Lunches	12,783.30	4,080.00
Supplies/Office Equipment	1,021.53	2,213.48
Postage	59.04	———
	72,469.01	35,398.94
High School Teacher's Salaries	31,310.00	17,340.00
Total	103,779.01	52,738.94

CONTRIBUTIONS/GRANTS

1986-1987 Academic Year

SPISE	
Brooklyn Union Gas	$ 500
Consolidated Edison of New York	7,500
E.I. DuPont de Nemours & Co.	3,000
Exxon Education Foundation	15,000
General Electric Foundation	5,000
International Business Machines Corp.	6,000
Motorola	3,000
New York Telephone Co.	6,825
New York Times Co. Foundation	5,000
RCA Corp.	6,000
	$ 57,825
New York City Board of Education[1]	31,310
	$ 89,135
SPISE-Extended	
AT&T Foundation	25,000
Dreyfus Corp.	1,000
J.M. Huber Corp.	1,500
	27,500
New York City Board of Education [1]	17,340
COMBINED TOTAL	$129,340

1 The Board of Education underwrites the cost of high school teacher participation in SPISE and SPISE-Extended, except for workshops for evaluation and curriculum and content development.

BUDGET - 1987-1988

ITEM	SPISE	SPISE-Extended
FACULTY		
College Professors	$12,160	$7,200
High School Coordinator	2,000	
Counselors	8,960	
Technicians	1,800	3,600
High School Teacher's Workshop	840	
HONORARIA	1,200	600
ADMINISTRATION/SUPERVISION	12,500	6,000
CLERICAL & PROGRAM ASST.	7,680	
EVALUATION	2,160	1,000
FICA	2,068	1,048
CALCULATORS	7,000	
LUNCHES	14,700	4,300
SUPPLIES AND PRINTING	4,000	2,000
POSTAGE	200	
LOCAL TRAVEL	100	
WORKSHOPS (Rewrite curriculum)		3,840
	77,368	29,588
INDIRECT COSTS 15%	11,605	4,438
	88,973	34,028
HIGH SCHOOL TEACHERS (Sessions)[2]	33,000	18,000
	$121,973	$52,028

2Funded by the New York City Board of Education.

SPONSORS OF SELECT PROGRAM IN SCIENCE AND ENGINEERING

1978 - 1987

AT&T Foundation

American Can Company

Bechtel Group, Inc.

Bell Laboratories

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Exxon Education Foundation

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RCA Corporation

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Texaco Inc.

Western Electric Fund

New York City Board of Education

TABLE 1

Mathematics Examination
Pre-Test/Post Test Comparisons

		Fall 1986 Students				Spring 1987 Students			
	Test	N	Mean	S.D.	t	N	Mean	S.D.	t
Part 1	Pre-test	159	13.63	3.27	10.79*	183	13.77	2.99	8.79*
	Post-test	159	15.01	3.04		183	14.95	3.08	
Part 2	Pre-test	159	2.73	1.62	19.40*	183	2.92	1.88	11.16*
	Post-test	159	4.11	1.76		183	4.27	2.03	
Total	Pre-test	159	16.36	3.22	11.57*	183	16.69	2.96	11.83*
	Post-test	159	19.12	3.41		183	19.22	3.01	

* t value significant at .001 level of confidence

23

24

TABLE 2

Student Opinion Questionnaire Items

Attitudes toward science	Attitudes toward mathematics
I enjoy going beyond the assigned work and try to solve new problems in science	Mathematics has contributed greatly to science and other fields of knowledge
Science is enjoyable and stimulating to me	Mathematics is less important to people than art or literature
Science makes me feel uneasy and confused	Mathematics is not important for the advancement of civilization and society
I am interested and willing to use science outside school and on the job	Mathematics is a very worthwhile and interesting subject
I have never liked science and it is my most dreaded subject	An understanding of mathematics is needed by artists and writers as well as by scientists
I have always enjoyed studying science in school	Mathematics helps develop a person's mind and teaches him to think
I am interested and willing to acquire further knowledge of science	Mathematics is not important in everyday life
Science is dull and boring because it leaves no room for personal opinion	Mathematics is needed in designing practically everything
I would like to develop my scientific skills and study the subject more	Mathematics is needed in order to keep the world running
Science is very interesting and I have usually enjoyed courses in this subject	There is nothing creative about mathematics; it's just memorizing formulas and things

TABLE 3

Summary of Science and Mathematics
Attitude Measures

		Fall 1986 Students				Spring 1987 Students			
	Test	N	Mean	S.D.	t	N	Mean	S.D.	t
Attitude Toward Science	Pre-test	153	35.69	3.87	7.13**	157	34.72	4.72	3.24*
	Post-test	153	38.66	4.43		157	37.33	4.98	
Attitude Toward Mathematics	Pre-test	153	34.13	4.19	6.92**	157	36.06	5.13	6.48**
	Post-test	153	37.10	3.92		157	39.16	4.92	
Combined Attitude	Pre-test	153	69.82	7.77	8.85**	157	70.78	7.58	6.73**
	Post-test	153	75.76	7.92		157	75.22	8.29	

* t value significant at .01 level of confidence

** t value significant at .001 level of confidence

TABLE 4

Student Evaluation Results

P = Poor F = Fair U = Uncertain or Don't Know G = Good E = Excellent

	Fall 1986 Students					Spring 1987 Students				
	P	F	U	G	E	P	F	U	G	E
Overall teaching quality	1%	5%	4%	53%	37%	0%	6%	2%	46%	46%
Math program and instruction	2%	2%	2%	53%	41%	2%	5%	4%	41%	48%
Engineering lab experiences	3%	5%	0%	36%	56%	1%	7%	3%	39%	50%
Science lab experiences	2%	6%	6%	41%	45%	1%	4%	2%	44%	49%
The 'after lunch' lectures	5%	18%	12%	41%	24%	3%	21%	16%	37%	23%
Special features (e.g. planetarium)	5%	5%	4%	21%	60%	4%	8%	15%	21%	52%
Counseling	6%	13%	11%	38%	32%	4%	7%	9%	40%	40%
Overall organization of the program	0%	1%	1%	41%	56%	1%	1%	0%	48%	46%

How would you rate the level of difficulty of the content material presented during the program?

The material was too easy for me: 9% (Fall 1986 students)
10% (Spring 1987 students)

The material was just about right in terms of difficulty level: 89% (Fall 1986 students)
87% (Spring 1987 students)

The material was too hard for me: 2% (Fall 1986 students)
3% (Spring 1987 students)

29

30

TABLE 5

Summary of Participants'
Evaluation of SPISE Extended Program

Question	Potential Response	Percent Choosing Response in: Computer Science	Chemistry	Physics
1. What is your overall feeling about the program?				
	a. one of the best	4	24	8
	b. great experience	12	48	31
	c. good experience	38	29	54
	d. okay	31	0	8
	e. dull	12	0	0
	f. waste of time	4	0	0
2. How much did you learn from this course?				
	a. a great deal	4	28	8
	b. a lot	19	48	38
	c. some things	42	24	54
	d. a few things	4	0	0
	e. nothing	0	0	0
3. Would you want to study further in this type of program?				
	a. yes, same subject	35	79	46
	b. yes, different subject	58	21	54
	c. No	7	0	0

TABLE 5

Summary of Participants'
Evaluation of SPISE Extended Program

Question	Potential Response	Percent Choosing Response in: Computer Science	Chemistry	Physics
4. Has your work in SPISE-EXTENDED helped you in your studies at school?				
	a. a great deal	4	4	18
	b. a lot	12	12	27
	c. some	15	42	27
	d. a little	31	30	27
	e. none	38	12	0
5. Has participating in SPISE-EXTENDED program had any effect on your interest in science and engineering as a possible career?				
	a. Yes, lot more interested	23	25	23
	b. Yes, some more interest	23	50	15
	c. Yes, little more interest	23	25	46
	d. no change in interest	31	0	8
	e. Yes, not interested in a career in science or engineering	0	0	8
	Number responding	26	26	13

At the end of the questionnaire participants were provided with the opportunity, in an open-end question, to indicate their general comments about the program. These free response comments are summarized in Table 2. A glance at the Table indicates that the students in different project areas had different suggestions. Those in Computer Science were most often concerned with scheduling, suggesting that the overall program be extended beyond five weeks and/or that each weekly session be made shorter. They noted that "a five weekend course is not enough to cover a complete, comprehensive group of materials", and that in a longer program "students would have the option of practicing what they learn". They were also concerned with content, suggesting that the Computer Science course be made "easier" and that other content be offered, either by "teaching Basic or other programing than Pascal" Finally, they complained about the quality of lunch ("I would appreciate a variety, not just ham and cheese for lunch, even caviar can get boring"), the lack of opportur for them to evaluate their own learning, and the need for greater selectivity in admitting students.

In contrast, the dominant response for the students in Chemistry was the nearly one in two who said there was no change necessary since the program "was fine as is" and so "I can't really think of anything to improve the program". Another 15 percen made a similarly general positive comment about the faculty ("very kind, patient and helpful"). As to specific suggestions, almost all concerned scheduling: a few studer in Chemistry, as in Computer Science, felt the program needed to be extended, others said that more laboratory time should be provided, ("fill with more experiments", "more technical experiements"). Two suggested hold the program in the summer, "on an everyday basis".

TABLE 6

Summary of Participant Suggestion on How To Improve Program

Area	Specific Suggestion	Percent of Times Mentioned In: Computer Science N=26	Chemistry N=26	Physics N=13
A. General	1. No change, fine as is	0	46	15
B. Schedule	1. Extend program, make longer	33	13	15
	2. Make each session shorter	13	0	15
	3. More lab time, more experiments	4	12	8
	4. Hold in summer	0	8	0
	5. Begin later in morning	0	4	0
C. Content	1. Make course easier	12	0	0
	2. Make course more advanced	0	0	46
	3. Offer other subjects	8	0	0
	4. Offer other aspects within area	4	4	8
	5. Better text	4	0	0
	6. Make more interesting	4	0	0
D. Faculty	1. General positive evaluation	0	15	0
	2. Add more to provide individual instruction	4	0	0
E. Students	1. Be more selective	8	0	0
F. Miscellaneous	1. Better lunch food	12	0	38
	2. More gym time	0	8	8
	3. Provide SPISE T-shirts, hats	0	4	0
	4. Provide evaluation of learning	8	0	0

Student Selection

In each of the fall and spring semesters, approximately 250 students from nine high schools are selected to take part in SPISE. Announcements are sent to all students in participating high schools who are enrolled in Biology and the Tenth Year Mathematics Course (Geometry or Part II of Integrated Mathematics).

The selection process focuses on three components:

- economic disadvantage
- interest in science and/or engineering
- a minimum level of computation skills necessary to profit from SPISE.

A multiple choice mathematics test is used to measure knowledge and achievement in basic arithmetic computation, basic algebra, and geometry, as well as to measure the kinds of mathematics skills and knowledge of concepts which will be covered during the program. This test also is used as a post-test to measure achievement gains.

Students complete a questionnaire which asks for information about parent annual income, level of education, occupations, number of dependents and home address. These factors are good indicators which enable teachers to identify the target population.

Student interest, as indicated by the initiative of applying for the program, and teacher evaluation are other factors in selection.

Acceptance into the SPISE Extended program requires successful completion of the 10 week SPISE experience during the sophomore or junior year.

Participating High Schools

Adlai Stevenson High School, Bronx

Andrew Jackson High School, Queens

August Martin High School, Queens

A. Philip Randolph Campus High School, Manhattan

Boys & Girls High School, Brooklyn

Brooklyn Technical High School, Brooklyn

Christopher Columbus High School, Bronx

De Witt Clinton High School, Bronx

Evander Childs High School, Bronx

Francis Lewis High School, Queens

George Washington High School, Manhattan

Harry S. Truman High School, Bronx

High School For the Humanities, Manhattan

Jamaica High School, Queens

Manhattan Center For Science & Mathematics, Manhattan

Queens Vocational High School, Queens

Seward Park High School, Manhattan

South Bronx High School, Bronx

Theodore Roosevelt High School, Bronx

Thomas Edison High School, Queens

Program Directors

Alfred S. Posamentier, Professor of Mathematics Education (Associate Dean, School of Education)

Demos Eitzer, Professor of Electrical Engineering

College Faculty Participants

John S. Arents, Professor Chemistry

Michael Arons, Professor Physics

Shermane A. Austin, Associate Professor Computer Science

Joseph Barba, Associate Professor Electrical Engineering

Victor Chung, Associate Professor Physics

Michael A. Engber, Associate Professor Mathematics (Assistant Dean of Science)

Leslie L. Isaacs, Professor Chemical Engineering

Joseph Pistrang, Professor Civil Engineering

Joseph Rennert, Professor (Emeritus)Chemistry

Richard Rommer, Meteorology

Kenneth Rubin, Professor Physics

Ali Sadegh, Assistant Professor Mechanical Engineering

Leonard H. Schwartz, Professor Chemistry

Harold L. Stolov, Professor Physics